GUJARAT TECHNOLOGICAL UNIVERSITY

BIOMEDICAL ENGINEERING (03)
MICROPROCESSOR & ITS INTERFACING
SUBJECT CODE: 2140304
B.E. 4th SEMESTER

Type of course: Microprocessor Architecture & working, Interfacing and Applications.

Prerequisite: Digital Signal & System, Digital Logic Design, Gates, Flip-flops, Counters, Registers, Memory devices.

Rationale: To prepare the students with basics of microprocessor & interfacing of various peripherals and also acquaint them with basics of programming.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	**Introduction to Microprocessor:** Microprocessor, Microprocessor systems with bus organization, Microprocessor Architecture & Operations, Memory, I/O Device, Memory and I/O Operations.	3	5%
2	**Internal architecture of 8085 microprocessor:** Block diagram, Registers, Internal Bus Organization, Functional details of pins, Control signals, External Address/Data bus multiplexing, Demultiplexing, I/O mapped I/O and memory mapped I/O techniques. **Instruction Timing**: T- states, Machine cycle (Opcode fetch, Read, write), Timing Diagrams of various instructions.	8	18%
3	**Serial communication:** Basic concepts, Software controlled asynchronous serial I/O, 8085 Serial I/O lines (SOD, SID). **Interrupts:** Interrupt Types (h/w, s/w, Maskable, Non-maskable), 8085 Interrupts & their Priorities, Vectored Interrupt.	6	12%
4	**Writing & Executing Programs:** Introduction to 8085 Assembly Language Programming, Classification of Instructions, Addressing Modes, 8085 Instruction Set, Instruction And Data Formats, Stack & Subroutines, Writing-Assembling & Executing a Program, Debugging the Programs, Developing Counters And Time Delay Routines. **Code Conversion:** BCD to Binary, Binary to BCD, BCD to 7-Segment LED, Binary to ASCII, ASCII to Binary. **BCD Arithmetic:** Addition, Subtraction and 16-Bit Data Operations (Multiplication, Subtraction).	12	22%
5	**Interfacing with 8085:** Interfacing Concepts, Ports, Interfacing Of I/O Devices, Interfacing of Data Converters (D to A and A to D),	12	22%

	Multipurpose Programmable Device (8155), Programmable peripheral interface (8255), Programmable Display/Keyboard interface (8279), Programmable timer interface (8253/8254), Programmable Interrupt Controller (8259A), Programmable serial communication interface (8251A).		
6	**Communication Protocols:** Parallel Communication Protocols (Centronics, IEEE-488), Serial Communication Protocols (RS-232, USB)	4	6%
7	**8085 Applications:** Interfacing of Data Acquisition System using ADC0809 with 8085 & Programming, Interfacing of 4 x 4 Matrix keyboard with 8085 & Programming, Interfacing of LCD with 8085 & Programming, Interfacing of 7-segment display with 8085 & Programming, Traffic light control, Stepper motor control, Flashing of LED's, Roll your name on 7-Segment display, Receive serial message using 8251, Transmit serial message using 8251.	9	15%

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
25%	25%	30%	5%	15%

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085 by Ramesh S. Gaonkar, Pub: Penram International.
2. Microcomputers and Microprocessors: The 8080, 8085 and Z-80 Programming, Interfacing and Troubleshooting by John E. Uffenbeck.
3. Microprocessor and Microcontroller fundamentals. The 8085 and 8051 Hardware and Software by William Kleitz.
4. 0000 to 8085: Introduction to Microprocessors for Engineers and Scientists, Ghosh and Sridhar, PHI, 2nd ed.
5. Microprocessor Lab Primer by K. A. Krishnamurthy, Interline Publishing

Course Outcomes:
After successful completion of the course students should be able to:

1. Identify the basic element and functions of microprocessor.
2. Describe the architecture of microprocessor and its peripheral devices.
3. Apply the programming techniques in developing the assembly language program for microprocessor application.
4. Demonstrate fundamental understanding on the operation between the microprocessor and its interfacing devices.

5. Complete the experiments in laboratory and present the technical report.
6. Built a microprocessor based mini project & do the programming on their own

List of Experiments:

1. To perform addition of two 8 bit numbers using 8085.
2. To perform the subtraction of two 8 bit numbers using 8085.
3. To perform the multiplication of two 8 bit numbers using 8085.
4. To perform the division of two 8 bit numbers using 8085.
5. To find the largest number in an array of data using 8085 instruction set.
6. To find the smallest number in an array of data using 8085 instruction set.
7. To write a program to arrange an array of data in ascending order.
8. To write a program to arrange an array of data in descending order.
9. To convert two BCD numbers in memory to the equivalent HEX number using 8085 instruction set.
10. To convert given Hexa decimal number into its equivalent BCD number using 8085 instruction set.
11. To convert given Hexa decimal number into its equivalent ASCII number using 8085 instruction set.
12. To convert given ASCII Character into its equivalent Hexa Decimal number using 8085 instruction set.
13. To find the square of the number from 0 to 9 using a Table of Square.
14. To write a program to initiate 8251 and to check the transmission and reception of character.
15. To write a program to initiate ADC and to store the digital data in memory.
16. To interface DAC with 8085 to demonstrate the generation of square, saw tooth and triangular wave.
17. To interface 8253 Programmable Interval Timer to 8085 and verify the operation of 8253 in six different modes.
18. To interface 8279 Programmable Keyboard Display Controller to 8085 Microprocessor.

Design based Problems (DP)/Open Ended Problem: Design 8085 M.P based Mini projects & Applications.

Major Equipment: 8085 Microprocessor base kit & Various Interfacing kits, 8085 Simulator

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.